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577 Date: 4-7-04  
Richard T. Lyon

PATENT  
Microsoft Docket No. 140726.2  
L&H No. MCS-101-99

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of  
Huang et al.

: Group Art Unit: 2623  
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Entitled: POSE-INVARIANT FACE  
RECOGNITION SYSTEM AND  
PROCESS

: Examiner: V. M. Kibler  
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Serial No.: 09/536,820

Filing Date: March 27, 2000

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Technology Center 2600

**RESPONSE UNDER 37 CFR 1.111**

Hon. Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

In regards to the Office Action dated January 15, 2004 (Paper No. 13), the applicants hereby respond as follows:

The application is believed to be in condition for allowance because the claims are nonobvious over the cited art. The following paragraphs provide the justification for these beliefs. In view of the following reasoning for allowance, the

applicants hereby respectfully request further examination and reconsideration of the subject application.

The Section 103(a) Rejection of Claims 1, 5, 10, 15, 20 and 25

Claims 1, 5, 10, 15, 20 and 25 were rejected under 35 USC 103(a) as being unpatentable over Rowley et al. (Rotation Invariant Neural Network-Based Face Detection) in view of Baluja et al., U.S. Patent No. 6,128, 397. It is contended in the Office Action that Rowley teaches all the elements of the rejected claims with the exception of identifying a person from an image of their face. However, it is further contended that the Baluja reference does teach this feature. Thus, it was concluded that it would have been obvious to incorporate the Baluja teachings into Rowley to produce the applicants' claimed invention. The applicants respectfully disagree with this contention of obviousness.

More particularly, the applicants describe and claim a feature whereby a network ensemble combines the outputs of classifiers to generate an output indicative of the person associated with a characterized input image region **and the face pose of that person**. A face pose is a term of art used in the face recognition field to "refer to the **particular pitch, roll and yaw angles that describe the position of a person's head**" as stated in the specification of the subject application on Page 3, lines 28-29. Neither of the cited references teaches providing the face pose, and so it is not taught in the combination thereof.

Rowley principally teaches a scheme where images of a person captured at different rotations in the image plane (i.e., different roll angles) are used to train a neural network ensemble to detect the presence of a face in an image. In addition, there was some mention of experiments into detecting faces in an image where the person's head was rotated out of the image plane and so depicted in profile rather than a frontal view (i.e., different yaw angles). However, it was stated that these experiments produced a significant number of false detections and missed faces.

(see Page 11, section 5). Of particular importance to the present rejection is that Rowley, goes on to state that combining both in plane and out of plane face detection (i.e., detecting faces regardless of the roll and yaw angles of the person's head) will be a subject for future work. Thus, Rowley merely suggests that a system which detects the presence of a face in an image regardless of the roll and yaw angles of the person's head, is a possibility. There is no teaching that a person of ordinary skill in the art could use to actually practice such a system. As such, the Rowley reference does not detect faces in images depicted with any pose because it principally only teaches the detection of faces having various roll angle variations, and at best teaches a failed attempt to detect faces in an image despite the yaw angle of the person's head. It does not teach how to detect faces in an image where both the yaw and roll angle can vary as such a system was only mentioned as a possibility and not actually described. Thus, it does not teach how to detect faces with any pose (i.e., with any pitch, roll or yaw angle). And most importantly, the Rowley reference does not teach that applicant's claimed feature of identifying the face pose of a person depicted in an image. Rather, the output of the Rowley system is simply an indication that a face has been detected in the image at a particular location. There is no identification of the roll angle, or the yaw angle, much less an identification of the full face pose of the detected face.

The Baluja reference teaches a face detection system that finds faces depicted in an image regardless of their image plane rotation and identifies the rotation angle of any face found. The image is then rotated using the rotation angle so as to produce an image with an upright face. It is then determined if the upright face is a frontal image of a face. It is also mentioned that a detected face can be provided to some unspecified system that identifies persons from images of a face. Additionally, this reference teaches that the "angle that the faces are oriented at in the image" can be detected (see Col. 5, lines 63-64). However, in regard to this face angle it is noted that the only angle found by the Baluja system is the image plane rotation angle. Thus, at best, it can be inferred that the Baluja system is capable of identifying a roll angle. Thus, this reference also fails to teach identifying

the face pose of an identified person as claimed by the applicants.

In order to deem the applicant's claimed invention unpatentable under 35 USC 103, a prima facie showing of obviousness must be made. To make a prima facie showing of obviousness, all of the claimed elements of an applicant's invention must be considered, especially when they are missing from the prior art. If a claimed element is not taught in the prior art and has advantages not appreciated by the prior art, then no prima facie case of obviousness exists. The Federal Circuit court has stated that it was error not to distinguish claims over a combination of prior art references where a material limitation in the claimed system and its purpose was not taught therein (*In Re Fine*, 837 F.2d 107, 5 USPQ2d 1596 (Fed. Cir. 1988)).

In this case, the cited combination does not teach identifying the face pose of an identified individual depicted in an image, as claimed by the applicants. At best, Rowley teaches using portions of the full face pose to detect faces in images without identifying these pose components, and Baluja teaches identifying the roll angle of a face in an image. Thus, the combined teachings of these references do not teach identifying the full face pose of an identified person. Nor does the cited combination recognize the advantages of doing so—namely knowing not only who is in an image but also where they may be looking. Thus, the applicants have claimed an element not taught in the cited combination, and which has advantages not recognized therein. Accordingly, no prima facie case of obviousness can be established in accordance with the holding of *In Re Fine*. This lack of prima facie showing of obviousness means that the rejected claims are patentable under 35 USC 103 over Rowley in view of Baluja. As such, it is respectfully requested that the rejection of Claims 1, 5, 10, 15, 20 and 25 be reconsidered based on the non-obvious claim language,

“training a neural network ensemble to identify a person and their face pose...a fusing neural network as its second stage which combines the outputs of the classifiers to generate an output indicative of the person

associated with the characterized input image region **and the face pose of that person**; and employing the network ensemble to identify the person associated with the characterized input image region **and the face pose of that person**".

The Section 103(a) Rejection of Claims 6, 9, 16, 19, 26, 29 and 31

Claims 6, 9, 16, 19, 26, 29 and 31 were rejected under 35 USC 103(a) as being unpatentable over Rowley in view of Baluja, and in further view of Turk et al., U.S. Patent No. 5,164,992. It is contended in the Office Action that the Rowley-Baluja combination teaches all the elements of the rejected claims with the exception of the details of using PCA. However, it is further contended that the Turk reference teaches this feature. Thus, it was concluded that it would have been obvious to incorporate the Turk teachings into the Rowley-Baluja combination to produce the applicants' claimed invention. The applicants respectfully disagree with this contention of obviousness.

As shown previously, the Rowley-Baluja combination does not teach identifying the full face pose of an identified person. Thus, the applicants have claimed an element not taught in the cited combination, and which have advantages not recognized therein. The addition of the PCA teachings of Turk does nothing to change the fact that the cited combination is missing the aforementioned claimed feature.

As such, no prima facie case of obviousness has been established in accordance with the holding of *In Re Fine*. This lack of prima facie showing of obviousness means that the rejected claims are patentable under 35 USC 103 over Rowley in view of Baluja, and in further view of Turk. It is, therefore, respectfully requested that the rejection of Claims 6, 9, 16, 19, 26, 29 and 31 be reconsidered based on the previously quoted non-obvious claim language.

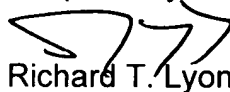
The Objections to Claims 7, 8, 17, 18, 27, 28 and 32-34

Claims 7, 8, 17, 18, 27, 28 and 32-34 were objected to as being dependent upon a rejected base claim. The Examiner stated that they would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The applicants at this time, however, respectfully decline to rewrite these claims because it is their position that the independent claims from which these claims depend are patentable.

Summary

In summary, it is believed that the pending claims are in condition for allowance. Accordingly, reconsideration of the rejection of Claims 1, 5, 6, 9, 10, 15, 16, 19-20, 25, 26, 29 and 31 and withdrawal of the objections to Claims 7, 8, 17, 18, 27, 28 and 32-34, are respectfully requested. In addition, allowance of these claims at an early date is courteously solicited.

Respectfully submitted,



Richard T. Lyon  
Registration No. 37,385  
Attorney for Applicant

LYON & HARR, LLP  
300 Esplanade Drive, Suite 800  
Oxnard, CA 93036  
(805) 278-8855